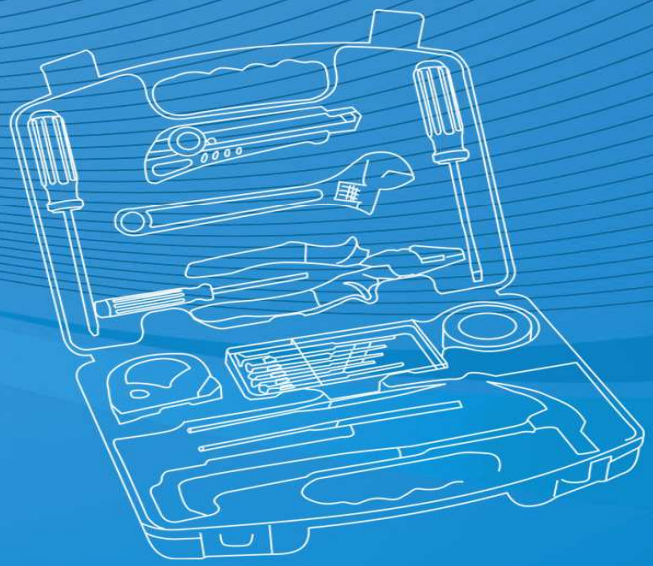
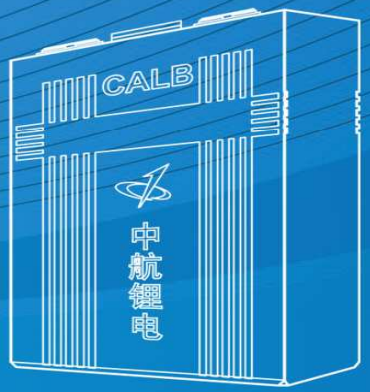
# PRODUCT USER MANUAL






# Product Owner Manual

## Attentions before Using

It is really appreciated that you choosing the Lithium battery that made by CALB. Please read this instruction carefully before using the battery. In order to make sure of using correctly, please keep this service manual carefully for future reference.

The users should read this manual carefully, familiar with the charging and discharging characteristics, understand the usage of BMS and charging generator before using the batteries.

## Using this manual

To quickly locate information about the battery use the Index in the back of the manual. It is an alphabetical list of what is in the manual and the page number where it can be found.

## Danger, Warnings, and Cautions

Warning message found in this manual describe hazards and what to do avoid or reduce them.

**Danger** indicates a hazard with a high level of risk which will result in serious injury.

**Warning** or **Cautions** indicates a hazard that could result in damage to the battery or injury human body.

**⚠ WARNING**

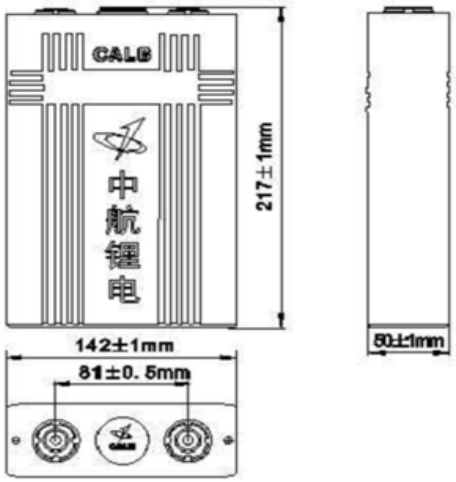
**This means there is something that could hurt you or other people.**

***Notice:*** **This means that something**

**could result in property or battery damage. This would not be covered by the battery's warranty.**

A circle with a slash through it is a safety symbol that means "Do not do this" or "Do not let this happen."

## Terminals




The positive terminal is made of aluminum, and the negative terminal is made of copper.

Both of them are soft metals, be careful when assembling the batteries, tighten the bolts to standard torque we suggested below.

| Battery | Bolts | Torque(N·m) |
|---|---|---|
| CA40 | M6×16 | 9 |
| CA60 | M6×16 | |
| SE60 | M6×16 | |
| CA63 | M6×16 | |
| CA100 | M8×16 | 20 |
| CA180 | M8×16 | |
| CA400 | M14×16 | 30 |
| ANX500 | M14×16 | |

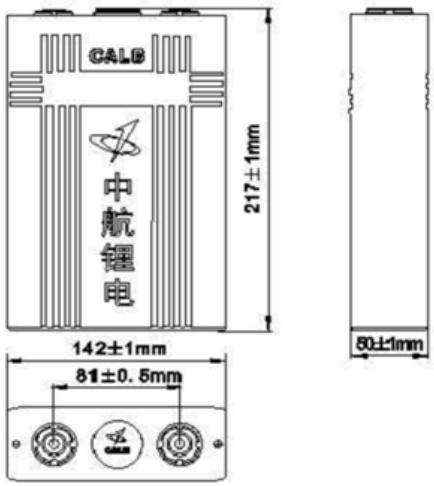

***Notice:*** **The terminals may oxidize in the air with longtime storage.**

**Please polish the terminals with abrasive paper when assembling the batteries.**

**⚠ WARNING**

**Do not twist the terminal under any circumstance. It is forbidden.**

## Safety valve




The safety valve is used to release the internal pressure to avoid body swollen.

***Notice:*** **The safety valve could prevent the water in the air getting into the battery.**

**⚠ WARNING**

**The safety valve will automatically open and close. Do not open the valve, it is forbidden.**

## Bar code

Bar code is the only identification of one battery. It consists of 16 digits, including 3 digits of area code, 3 digits of capacity code, 6 digits of production date and 4 digits of serial number.

Specific Instructions are as follows:

1. **Area Code:** "NSA" means America, "Space +EU" means Europe, and "Space +AP" means Asia, Africa or Australia.
2. **Capacity Code**: It is the number of the battery's capacity. For example, the capacity code of CA100FI is "100".
3. **Production Date:** Manufacturing Department mainly confirmed the

date. Same date with a batch of batteries is suggested. The Date format is: year/mouth/day. For example, Dec.2nd, 2010, that is 101202 which generally for the date of production.

4. **Serial Number:** Based on the amount of batteries, 4 digits in all. Such as the serial number of the 20th battery is 0020.

***Notice:*** **The bar code is the only certificate of identification, it is required to show when warranty. Please keep the bar code in good condition.**

## Charging & discharging requirements

Addition to the special description, the following is the charging & discharging parameter.

1. The constant charging voltage for individual cell is "3.65V". It also can be used in CCCV charging mode when getting into CV model.

   The constant charging voltage of a pack is "N×3.65V". "N" means the number of the batteries in the pack.

*Notice:* **In order to prevent over charging, the charger shall automatic convert to CV model when any individual cell's voltage rise up to 3.65V.**

2. When the charging current of CCCV model lower than 0.05C, charging process shall be stopped.

3. The maximum charging voltage for individual cell is 3.8V. Charging process must be stopped immediately when any cell's voltage rise up to 3.8V.

**⚠ WARNING**

**Over charging will cause irreparable damage to the battery, also with high level of risk that will result in injury human body.**

4. The floating charge voltage for Individual cell is 3.40V.

   The floating charge voltage for pack is "N×3.4V". "N" means the number of the batteries in the pack.

5. The minimal discharging voltage is 2.5V.

   When the temperature is below -20℃, it is 2.0V.

*Notice:* **The depth of discharge is more than 90% when an individual cell's voltage falls down to 3.0V, it is nearly exhausted. Please charge your pack as quickly as possible.**

**⚠ CAUTION**

**If anyone cell’ s voltage falls down to 2.0V, Discharging process must be cut-off immediately. Longtime over discharge Will cause irreparable damage to he battery.**

**6.** Working temperature: The working temperature range for charging is 0℃ ~ 40℃, and the working temperature range for discharging is -20℃ ~ 50℃.

***Notice:*** **BMS shall be able to boot the cooling fan when the cell’s temperature rises up to 40℃, and decrease the motor power when cell’s temperature rise up to 50℃, and shut down the motor when the cell’s temperature rise up to 55℃.**

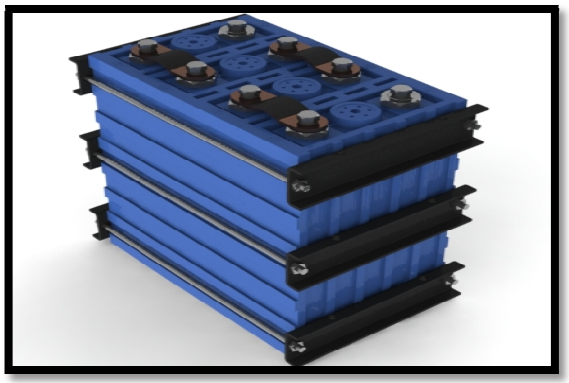
## Basic Requirements for Battery Installation

1. Each group of batteries must be properly fixed to the battery box and stand directly.

**⚠ CAUTION**

**Changing the placement direction is not recommended.**

2. When using the battery modular group fixture provided by our company, make sure to tighten flat mattress and spring mattress on the rod, assemble and tighten the nut completely to ensure the battery pack maintain clamping state during the bumping driving process.



3. The pack in the compartment should keep 30mm-50mm space at the top to facilitate the connection of a battery management system, wiring harness and repair lines also for better heat elimination.

4. When clamped battery modules are installed inside of the battery cabinet, the bottom and all around of batteries shall be lay with a layer of elastic items such as rubber for shock absorption, the installation of battery cabinet on the frame shall take appropriate vibration reduction measures.

5. Consider cooling measures for designing the layout and installation of batteries and battery cabinets. Battery cooling methods can be varied, with the most basic one of adopting fan cooling. Consider air-flow problems of vehicle at run time when designing, you can also drum the cold air of train carriage or air conditioning system into the battery compartment, in order to achieve the purpose of cooling batteries;

## Basic Requirements for Battery Connection

1. Power supply modules or batteries' installation must be operated by trained professionals. Installations must be operated strictly in accordance with the relevant work instruction manual.

2. It is necessary to put on insulating gloves when packing the batteries.

3. The metallic tools, such as socket wrench, screwdriver and fixed wrench, must be insulated by electrical tape.

**⚠ WARNING**

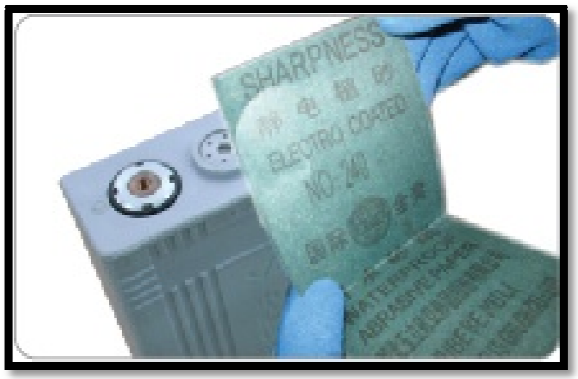
**Pay attention to the metal items carrying-on, such as key chains, watches, necklaces etc. Never contact those metal items to the cell’ s terminals, That may cause in short circuit.**

**4.** Be careful when packing the batteries. Great attention must be paid to avoiding short circuit and wrong connection, which may cause great damage to human body and the batteries.

**5.** Please sanding the battery’s terminals before packing them, that could remove the oxide layer and reduce the contact resistance.

**6.** After batteries’ group-selection, battery pole shall be taken insulated protection measures.

**7.** Be sure to install the quick-acting fuse or DC air breaker in the main circuit, in order to protect the battery pack.




**8.** Please tighten the bolts to avoid increasing the contract resistance.

**9.** The cell’s terminals are made of soft metals, please do not use excessive force when tighten the bolts, and do not strip the screw thread.

## Basic requirements for battery storage and maintenance

1. The batteries should be stored at temperature of 5-40 ℃, dry, clean and well-ventilated warehouse.

2. Batteries in using or in inventory should be excluded from direct sunlight, and be away from the heat sources at a distance of no less than 2m. If it has to be allocated near the heat source, then the proper insulation measures should be taken

3. Take full account of water flooded, shock-resistance for battery cabinet's layout.

4. Batteries shall be stored in boxes, or flat laid with insulated material and marked clearly.

5. Battery in inventory shall not be placed upside down or lying. Mechanical shock or stress, and cells exposed to heat and rain is strictly prohibited.

6. Formulate the tracking table for battery in inventory. Checking the battery's voltage every month and record on the tracking table.

***Notice:*** **If the cell's voltage is lower than 3.0V, it is nearly exhausted. Please charge the cells with 0.3C for one hour as soon as possible.**

7. Fully charge and discharge the cells every six months with 0.3C, and record the result.

8. When considering the battery layout, make sure batteries' external environment, especially ambient temperature conditions, are consistent as far as possible, temperature differentials must not exceed 5℃.

## Troubleshooting Methods

**1.** Great attention must be paid to the security of repair maintenance operations and construction of high-voltage battery pack.


**2.** The positive terminal is made of aluminum material, and the negative terminal is made of copper. Please obey the rules provided at “Terminals” when you screwing the bolts.

***Notice:*** **If the screw thread was broken that can’t tight the bolt, repairing is not allowed, please contact the customer service of CALB.**

**3.** During the process of charging and discharging, in particular, high-current charge and discharge the battery, if BMS detected any certain individual battery voltage fluctuated widely, and was markedly different from other batteries, please check on it carefully.

1）Whether you have tightened the bolt on the terminals, if not, please tighten it.

2）Whether the oxide layer on the surface of the battery's two polarity pole has been wiped off; if not, use sand paper to clean it.

3）Whether the BMS voltage acquisition line is reliable, please correct the fact connection if not .

4）Whether there are problems of connection across compartment or over length of wire. Large tolerance will be caused by high voltage depreciation.

5）If there is oxide layer between busbar sheets, please

replace the busbar.

4. Once the battery has been over discharged accidentally, you could try to repair it as follows:

   1）First, charging the battery with lower than 0.1C current.

   2）When the cell's voltage rises up to 3.2V, you could charge it with higher current.

   3）If the cell's voltage can't rise up to 3.2V with long time charging. Please replace it with the backup battery.

5. Once you reverse charging the cells, please replace the cells with substitutions. Make sure the new cell gains the same SOC with other cells.

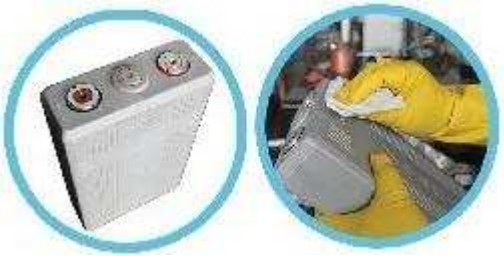
6. If you have any other technical problem, welcome to contact the customer service department,

## Emergency processing

The electrolyte of lithium-ion power battery is lithium salts organic solvents, which is corrosive, being damage if disclosure incurs. If it is inadvertently leaked, the following first-aid measures shall be taken:

1. Release measures

   1）Method 1: If electrolyte leaks on the shell surface, you need to wear corrosion protective gloves, wipe with a cloth impregnated with alcohol, and to dry.



2）Method 2: If electrolyte reliefs from safety valve in the form of gaseous, immediately evacuate the people present, wear gas masks and insulated gloves, turn the battery upside down (with the side having valve down) in a dry plastic buckets, then immediately transfer the barrel to ventilation environment.

**2.** Eye contact: quickly rinse eyes with plenty of water for more than 15 minutes, during which lift the upper and lower eyelids. Turn to medical treatment if it is serious.

**3.** Skin contact: remove clothes, washing with plenty of water for 15 minutes. Turn to medical treatment if it is serious.

**4.** Inhalation: move to ventilated place. Oxygen as needed. Turn to medical treatment if it is serious.

**5.** Ingestion: take orally 2 cups milk or water. Vomitoria is forbidden under unconscious. Turn to medical treatment if it is serious

## Quality Assurance

1. CALB provide three years warranty of the batteries. If batteries cannot be used because of the quality, and is in accord with the exchanging requirement, CALB will exchange them for free, including the round-trip freight.
2. Barcode will be used to identify the cell when offering warranty. CALB will not be responsible for customer service if there is no barcode.

***Notice:*** **If one cell was sold to the market out of the area as it's marked in the barcode, CALB won't offer warranty.**

3. According to the area code, the representative office which is in charge of this area will solve the problem. Head office of CALB will not be responsible for after-sale service directly.
4. Before setting up the overseas representative office, head office of CALB is in charge of the after-sale service directly.
5. The battery warranty period is 36 months (from the date of shipping out of factory). If there are warranty terms in the contract, please follow the contract.
6. Identification method: the identification must be proceeded by CALB's Customer Service Department or the third party authority admitted by CALB. The fare will be paid by customers in advance. The result of the identification shows that if batteries do have quality problems, CALB will pay the fare and send money back to customers in cash or some other ways, if not, customers will pay instead.
7. Methods for quality assurance:
   1）In the quality assurance period, if the batteries cannot be used because of its quality problem, please first contact the technician in the nearest representative office for consultancy.
   2）After the confirmation from

the technicians, please send the problematic battery to the representative office. At the same time, the technicians there would give relevant feedback to the CALB's Customer Service Department.

3）After the representative office receives the abnormal battery, it will have them tested, and if it does have a problem, an email with an application for exchanging battery will be sent to Customer Service Department, and then report to the manager in Marketing Department. The problematic battery will be exchanged after the confirmation by the manager.

4）The representative office will mark, record and store these problematic batteries in certain places for future recollection.

5）The quality assurance period for newly exchanged battery is based on the date of previous ones.

**8.** Customers must fill in the Battery Quality Issue Feedback Sheet first, and also offer the photos or data of unqualified batteries.

## Disclaimer

CALB shall not undertake the cost which caused by users' inappropriate usage of the products as follows:

1. Using or testing batteries without reliable BMS or PCB, which cause part short-circuit or over discharge.
2. Revering charges the cells which destroy the cells.
3. Not effectively controlling the charging process which over charge the cells.
4. Not effectively controlling the discharging process which over discharge the cells.
5. Not selecting appropriate cable, connector, lug and other electrical components which cause safety issues by over heat.
6. Not installing high voltage protection component within main loop. Damage the device by damaged and aging of the wire.
7. Adopting the connection method which affect the SOC balance of battery pack (exp. support devices with the power from some of the cells), which may cause over discharge of some cells.
8. Wrong connection between cable lug and bus bar, decrease the life span by over heat which caused by loosen of the bolt.
9. Not checking and maintaining the batteries periodically, not removing the accident potential on time.

## The final explanation rights of the manual are reserved by CALB

CALB will edit this document occasionally. A modified document is provided to customers only with the package, CALB does not undertake the responsibility of notifying the original customer. All of the users could search for solutions on our website or through technical service.

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